

Subchapter III – Standards for Protection from Radiation

HFS 157.20 Implementation. (1) Any existing license or registration condition more restrictive than this subchapter remains in force until there is an amendment or renewal of the license or registration.

(2) If a condition attached to a license or registration exempts a licensee or registrant from a provision of this subchapter in effect on or before the effective date of this subchapter [revisor to insert effective date], the condition also exempts the licensee or registrant from the corresponding provision of this subchapter.

(3) If a condition attached to a license or registration cites provisions of this subchapter in effect prior to the effective date of this subchapter [revisor to insert effective date] that do not correspond to any provisions of this subchapter, the license or registration condition remains in force until there is an amendment or renewal of the license or registration that modifies or removes the condition.

HFS 157.21 Radiation protection programs. (1) A licensee or registrant shall develop, document and implement a radiation protection program sufficient to ensure compliance with the provisions of this subchapter.

Note: See s. HFS 157.31 (2) for record keeping requirements relating to programs in this subchapter.

(2) A licensee or registrant shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable.

(3) A licensee or registrant shall, at intervals not to exceed 12 months, review the radiation protection program content and implementation.

(4) To implement the ALARA requirements of sub. (2), and notwithstanding the requirements in s. HFS 157.23 (1), a licensee shall establish a constraint on air emissions of radioactive material to the environment, excluding Radon-222 and its progeny, so that an individual member of the public likely to receive the highest dose does not receive a total effective dose equivalent in excess of 0.1 mSv (10 mrem) per year from the air emissions. A licensee to whom this requirement applies shall report as provided in s. HFS 157.32 (3) any time the licensee exceeds the dose limit of 0.1 mSv (10 mrem) per year and shall promptly take appropriate corrective action to safeguard against recurrence.

HFS 157.22 Occupational dose limits. (1) OCCUPATIONAL DOSE LIMITS FOR ADULTS. (a) A licensee or registrant shall control the occupational dose to individual adults, except for planned special exposures under sub. (6), to the following dose limits:

1. An annual limit, which is the more limiting of either of the following:

a. The total effective dose equivalent being equal to 0.05 Sv (5 rem).

b. The sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 0.5 Sv (50 rem).

2. The annual limits to the lens of the eye, to the skin and to the extremities which are:

a. A lens dose equivalent of 0.15 Sv (15 rem).

b. A shallow dose equivalent of 0.5 Sv (50 rem) to the skin or to any extremity.

(b) Doses received in excess of the annual limits, including doses received during accidents, emergencies and planned special exposures, shall be subtracted from the limits for planned special exposures that the individual may receive during the current year and during the individual's lifetime.

(c) The assigned deep dose equivalent and shallow dose equivalent shall be for the portion of the body receiving the highest exposure, as follows:

1. The deep dose equivalent, lens dose equivalent and shallow dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits, if the individual monitoring device was not in the region of highest potential exposure, or the results of individual monitoring are unavailable.

2. When a protective apron is worn while working with medical fluoroscopic equipment and monitoring is conducted as specified in s. HFS 157.25 (2) (a) 5., the effective dose equivalent for external radiation shall be determined as follows:

a. When only one individual monitoring device is used and it is located at the neck outside the protective apron, and the exposure is less than 25 percent of any limit specified in par. (a), the reported deep dose equivalent shall be the effective dose equivalent for external radiation.

b. When only one individual monitoring device is used and it is located at the neck outside the apron and the exposure is greater than 25 percent of the any limit specified in par. (a), the effective dose equivalent shall be the deep dose equivalent multiplied by 0.3.

c. If a protective apron is worn, the individual monitoring device shall be located at the neck, which is, collar. If a second monitoring device is used, for the same purpose, it shall be located under the protective apron at the waist. The estimated effective dose equivalent (H_E) when wearing 2 monitoring devices, one located outside and one under a protective apron, shall be calculated using the following formula: $H_E (\text{estimate}) = 1.5 H_W + 0.04 H_N$ where H_W = badge reading from the waist badge under the apron and H_N = badge reading from the neck badge worn outside the apron.

(d) Derived air concentration and annual limit on intake values are specified in Table I of Appendix E and may be used to determine the individual's dose and to demonstrate compliance with the occupational dose limits.

Note: See s. HFS 157.31 (7) for instructions about recording the exposure levels.

(e) In addition to the annual dose limits, a licensee or registrant shall limit the soluble uranium intake by an individual to 10 milligrams in a week in consideration of chemical toxicity.

Note: See footnote ^{g/} of Appendix E for the calculation method for determining DAC for soluble mixtures of uranium.

(f) A licensee or registrant shall reduce the dose that an individual may be allowed to receive in the current year by the amount of occupational dose received while employed by any other person during the current year.

Note: See sub. (5) for instruction on determining occupational dose.

(2) COMPLIANCE WITH REQUIREMENTS FOR SUMMATION OF EXTERNAL AND INTERNAL DOSES. (a) If a licensee or registrant is required to monitor under both s. HFS 157.25 (2) (a) and (b), a licensee or registrant shall demonstrate compliance with the dose limits by summing external and internal doses. If a licensee or registrant is required to monitor only under s. HFS 157.25 (2) (a) or (b), then summation is not required to demonstrate compliance with the dose limits. A licensee or registrant may demonstrate compliance with the requirements for summation of external and internal doses by meeting one of the conditions in par. (b) and the conditions of pars. (c) and (d). The dose equivalents for the lens of the eye, the skin and the extremities are not included in the summation, but are subject to separate limits.

(b) If the only intake of radionuclides is by inhalation, the total effective dose equivalent limit is not exceeded if the sum of the deep dose equivalent divided by the total effective dose equivalent limit, and any one of the following, does not exceed unity:

1. The sum of the fractions of the inhalation ALI for each radionuclide.
2. The total number of derived air concentration-hours for all radionuclides divided by 2,000.
3. The sum of the calculated committed effective dose equivalents to all significantly irradiated organs or tissues calculated from bioassay data using appropriate biological models and expressed as a fraction of the annual limit. For purposes of this subdivision, an organ or tissue is deemed to be significantly irradiated if, for that organ or tissue, the product of the weighting factors, w_T , and the committed dose equivalent, $H_{T,50}$, per unit intake is greater than 10 percent of the maximum weighted value of $H_{T,50}$, that is, $w_T H_{T,50}$, per unit intake for any organ or tissue.

(c) If the occupationally exposed individual also receives an intake of radionuclides by oral ingestion greater than 10 percent of the applicable oral ALI, a licensee or registrant shall account for this intake and include it in demonstrating compliance with the limits.

(d) A licensee or registrant shall evaluate and, to the extent practical, account for intakes through wounds or skin absorption. The intake through intact skin has been included in the calculation of DAC for hydrogen-3 and does not need to be evaluated or taken into account.

(3) DETERMINATION OF EXTERNAL DOSES FROM AIRBORNE RADIOACTIVE MATERIAL. (a) A licensee or registrant shall, when determining the dose from airborne radioactive material, include the contribution to the deep dose equivalent, eye dose equivalent, and shallow dose equivalent from external exposure to the radioactive cloud.

Note: See Appendix E, footnotes ^{a/} and ^{b/} for methods used for calculating dose from exposure to a radioactive cloud for materials that have a half-life of less than 2 hours.

(b) Airborne radioactivity measurements and DAC values may not be used as the primary means to assess the deep dose equivalent when the airborne radioactive material includes radionuclides other than noble gases or if the cloud of airborne radioactive material is not relatively uniform in its distribution of radioactive material in the cloud. The determination of the deep dose equivalent to an individual shall be based upon measurements using instruments or individual monitoring devices.

(4) DETERMINATION OF INTERNAL EXPOSURE. (a) For purposes of assessing dose used to determine compliance with occupational dose equivalent limits, a licensee or registrant shall, when required under s. HFS 157.25 (2), take suitable and timely measurements of all of the following:

1. Concentrations of airborne radioactive materials in work areas.
2. Quantities of radionuclides in the body.
3. Quantities of radionuclides excreted from the body.
4. Combinations of the measurements in subds. 1. to 3.

(b) Unless respiratory protective equipment is used, as provided in s. HFS 157.27 (3), or the assessment of intake is based on bioassays, a licensee or registrant shall assume that an individual inhales radioactive material at the airborne concentration in which the individual is present.

(c) When the physical and biochemical properties of the radionuclides taken into the body or the behavior of the material in an individual is known, a licensee or registrant may do any of the following:

1. Use that information to calculate the committed effective dose equivalent, and, if used, the licensee or registrant shall document that information in the individual's record.
2. Upon prior approval of the department, adjust the DAC or ALI values to reflect the actual physical and chemical characteristics of airborne radioactive material, for example, aerosol size distribution or density.
3. Separately assess the contribution of fractional intakes of Class D, W or Y compounds of a given radionuclide to the committed effective dose equivalent.

Note: See Appendix E for a description of the pulmonary clearance times of the compounds involved in the exposure.

(d) If a licensee or registrant chooses to assess intakes of Class Y material using the measurements given in par. (a) 2. or 3., a licensee or registrant may delay the recording and reporting of the assessments for periods up to 7 months, unless otherwise required by s. HFS 157.32 (2) or (3).

Note: The delay permits the licensee or registrant to make additional measurements basic to the assessments.

(e) If the identity and concentration of each radionuclide in a mixture are known, the fraction of the DAC applicable to the mixture for use in calculating DAC-hours shall be either of the following:

1. The sum of the ratios of the concentration to the appropriate DAC value, that is, D, W or Y, from Appendix E for each radionuclide in the mixture.

2. The ratio of the total concentration for all radionuclides in the mixture to the most restrictive DAC value for any radionuclide in the mixture.

(f) If the identity of each radionuclide in a mixture is known, but the concentration of one or more of the radionuclides in the mixture is not known, the DAC for the mixture shall be the most restrictive DAC of any radionuclide in the mixture.

(g) When a mixture of radionuclides in air exists, a licensee or registrant may disregard certain radionuclides in the mixture if all of the following apply:

1. The licensee or registrant uses the total activity of the mixture in demonstrating compliance with the dose limits in s. HFS 157.22 (1) and in complying with the monitoring requirements in s. HFS 157.25 (2) (b).

2. The concentration of any radionuclide disregarded is less than 10 percent of its DAC.

3. The sum of the percentages under subds. 1. and 2. for all of the radionuclides disregarded in the mixture does not exceed 30 percent.

(h) When determining the committed effective dose equivalent, the following information may be considered:

1. To calculate the committed effective dose equivalent, the licensee or registrant may assume that the inhalation of one ALI, or an exposure of 2,000 DAC-hours, results in a committed effective dose equivalent of 0.05 Sv (5 rem) for radionuclides that have their ALIs or DACs based on the committed effective dose equivalent.

2. For an ALI and the associated DAC determined by the nonstochastic organ dose limit of 0.5 Sv (50 rem), the intake of radionuclides that would result in a committed effective dose equivalent of 0.05 Sv (5 rem), that is, the stochastic ALI, is listed in parentheses in Table I of Appendix E. The licensee or registrant may, as a simplifying assumption, use the stochastic ALI to determine committed effective dose equivalent. However, if the licensee or registrant uses the stochastic ALI, the licensee or registrant shall also demonstrate that the limit in s. HFS 157.22 (1) (a) 1. b. is met.

(5) DETERMINATION OF PRIOR OCCUPATIONAL DOSE. (a) For each individual who may enter a licensee's or registrant's restricted area and is likely to receive, in a year, an occupational dose requiring monitoring under s. HFS 157.25 (2), a licensee or registrant shall determine the occupational radiation dose received during the current year.

(b) Before an individual may participate in a planned special exposure, a licensee or registrant shall determine all of the following:

1. The internal and external doses from all previous planned special exposures.

2. All doses in excess of the limits, including doses received during accidents and emergencies, received during the lifetime of the individual.

(c) In complying with the requirements of par. (a), a licensee or registrant may use either of the following means:

1. Accept, as a record of the occupational dose that the individual received during the current year, a written signed statement from the individual, or from the individual's most recent employer for work involving radiation exposure, that discloses the nature and the amount of any occupational dose that the individual received during the current year.

2. Obtain, by telephone, facsimile, electronic media or letter, reports of the individual's dose equivalent from the most recent employer for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee or registrant. A licensee or registrant shall request a written verification of the dose data if the authenticity of the transmitted report cannot be established.

(d) 1. A licensee or registrant shall record the exposure history, as required by par. (a), on a occupational radiation exposure form provided by the department, or other clear and legible record of all the information required on that form. The form or record shall show each period in which the individual received occupational exposure to radiation or radioactive material and shall be signed by the individual who received the exposure. For each period for which a licensee or registrant obtains reports, a licensee or registrant shall use the dose shown in the report in preparing the occupational radiation exposure form or equivalent. For any period in which a licensee or registrant does not obtain a report, a licensee or registrant shall place a notation on the occupational radiation exposure form or equivalent indicating the periods of time for which data are not available.

Note: An occupational radiation exposure history form may be obtained by writing to: Department of Health and Family Services, Radiation Protection Section, P.O. Box 2659, Madison WI 53701-2659; or by downloading the form from the Department website at: www.dhfs.state.wi.us/licensing/.

2. A licensee or registrant is not required to partition historical dose between external dose equivalents and internal committed dose equivalents. Further, occupational exposure histories obtained and recorded on the department's occupational radiation exposure form or equivalent before the effective date of this subchapter [revisor to insert effective date], may not have included effective dose equivalent, but may be used in the absence of specific information on the intake of radionuclides by the individual.

(e) If a licensee or registrant is unable to obtain a complete record of an individual's current and previously accumulated occupational dose, a licensee or registrant shall assume all the following:

1. In establishing administrative controls under sub. (1) (f) for the current year, that the allowable dose limit for the individual is reduced by 12.5 mSv (1.25 rem) for each quarter for which records were unavailable and the individual was engaged in activities that could have resulted in occupational radiation exposure.

2. That the individual is not available for planned special exposures.

(f) A licensee or registrant shall retain the records on the department's occupational radiation exposure form or equivalent until the department terminates each pertinent license or registration requiring this record. A licensee or registrant shall retain records used in preparing the occupational radiation exposure form or equivalent for 3 years after the record is made.

Note: The department's occupational radiation exposure history form may be obtained by writing to: Department of Health and Family Services, Radiation Protection Section, P.O. Box 2659, Madison WI 53701-2659; or by downloading the form from the department website at: www.dhfs.state.wi.us/licensing/.

(6) PLANNED SPECIAL EXPOSURES. A licensee or registrant may authorize an adult worker to receive doses in addition to and accounted for separately from the doses received under the limits specified in sub. (1) provided that each of the following conditions is satisfied:

(a) A licensee or registrant authorizes a planned special exposure only in an exceptional situation when alternatives that might avoid the dose estimated to result from the planned special exposure are unavailable or impractical.

(b) A licensee or registrant and employer, if the employer is not the licensee or registrant, specifically authorizes the planned special exposure, in writing, before the exposure occurs.

(c) Before a planned special exposure, a licensee or registrant ensures that each individual involved has been informed and instructed in all the following:

1. The purpose of the planned operation.
2. The estimated doses and associated potential risks and specific radiation levels or other conditions that might be involved in performing the task.
3. The measures to be taken to keep the dose ALARA considering other risks that may be present.

(d) Prior to permitting an individual to participate in a planned special exposure, a licensee or registrant ascertains prior doses as required by sub. (5) (b) during the lifetime of the individual for each individual involved.

(e) Subject to sub. (1) (b), a licensee or registrant may not authorize a planned special exposure that would cause an individual to receive a dose from all planned special exposures and all doses in excess of any of the following limits:

1. The numerical values of any of the dose limits in sub. (1) (a) in any year.
2. Five times the annual dose limits in sub. (1) (a) during the individual's lifetime.

(f) A licensee or registrant maintains records of the conduct of a planned special exposure under s. HFS 157.31 (6) and submits a written report under s. HFS 157.32 (4).

(g) A licensee or registrant records the best estimate of the dose resulting from the planned special exposure in the individual's record and informs the individual, in writing, of the

dose within 30 days from the date of the planned special exposure. The dose from planned special exposures may not be considered in controlling future occupational dose of the individual under sub. (1) (a) but shall be included in evaluations required by pars. (d) and (e).

(7) OCCUPATIONAL DOSE LIMIT FOR A MINOR. (a) The annual occupational dose limit for a minor is 10 percent of the annual occupational dose limits specified for adult workers in sub. (1).

(b) A minor may not work in an area where the minor could receive a deep dose equivalent in excess of .02 mSv (2 mrem) in any one hour unless authorized in writing by the department.

(8) DOSE EQUIVALENT TO AN EMBRYO OR FETUS. (a) A licensee or registrant shall ensure that the dose equivalent to an embryo or fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 5 mSv (500 mrem).

Note: See HFS 157.31 (7) for record keeping requirements.

(b) A licensee or registrant shall make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman so as to satisfy the limit in par. (a).

Note: The National Council on Radiation Protection and Measurements recommended in NCRP Report No. 91, "Recommendations on Limits for Exposure to Ionizing Radiation," June, 1, 1987, that no more than 0.5 mSv (50 mrem) to the embryo or fetus be received in any one month.

(c) The dose to an embryo or fetus is the sum of all of the following:

1. The deep dose equivalent to the declared pregnant women.
2. The dose equivalent to the embryo or fetus resulting from radionuclides in the embryo or fetus and radionuclides in the declared pregnant woman.

(d) If the dose equivalent to the embryo or fetus is found to have exceeded 5 mSv (500 mrem), or is within 0.5 mSv (50 mrem) of this dose, by the time the woman declares the pregnancy to a licensee or registrant, a licensee or registrant shall be deemed to be in compliance with par. (a) if the additional dose equivalent to the embryo or fetus does not exceed 0.5 mSv (50 mrem) during the remainder of the pregnancy.

HFS 157.23 Radiation dose limits for individual members of the public. (1) DOSE LIMITS FOR INDIVIDUAL MEMBERS OF THE PUBLIC. (a) A licensee or registrant shall conduct operations to meet all of the following:

1. The total effective dose equivalent to individual members of the public from the licensed or registered operation may not exceed one mSv (100 mrem) in a year, exclusive of the dose contribution from background radiation, medical radiation exposure, exposure to individuals administered radioactive material and released in accordance with s. HFS 157.62 (8), voluntary participation in medical research programs and the licensee's or registrant's disposal of radioactive material into sanitary sewerage under s. HFS 157.30 (3). Facilities with radiation machines installed prior to the effective date of this subchapter [revisor to insert

effective date] that meet the requirements of 5 mSv (500 mrem) in a year are exempt from this requirement.

2. The dose in any unrestricted area from external sources does not exceed 0.02 mSv (2 mrem) in any one hour, exclusive of the dose contributions from patients administered radioactive material and released in accordance with s. HFS 157.62 (8).

(b) If a licensee or registrant permits members of the public to have access to controlled areas, the limits under par. (a) 1. for members of the public continue to apply to those individuals.

(c) A licensee or a registrant or an applicant for a license or registration may apply for prior department authorization to operate up to an annual dose limit for an individual member of the public of 5 mSv (500 mrem). The application shall include all the following information:

1. Demonstration of the need for and the expected duration of operations exceeding the limit in par. (a).

2. A licensee's or registrant's program to assess and control dose within the 5 mSv (500 mrem) annual limit.

3. The procedures to be followed to maintain the dose ALARA.

(d) In addition to the requirements of this section, a licensee or registrant subject to the provisions of the U.S. environmental protection agency's generally applicable environmental radiation standards in 40 CFR 190 shall comply with those standards.

(e) The department may impose additional restrictions on radiation levels in unrestricted areas and on the total quantity of radionuclides that a licensee or registrant may release in effluents to restrict the collective dose.

(f) A licensee or registrant may permit visitors to individuals who cannot be released under s. HFS 157.62 (8). A visitor may receive a radiation dose greater than one mSv (100 mrem) if both of the following conditions are met:

1. The radiation dose received by the visitor does not exceed 5 mSv (0.5 rem).

2. The authorized user has predetermined that the visit is appropriate.

(2) COMPLIANCE WITH DOSE LIMITS FOR INDIVIDUAL MEMBERS OF THE PUBLIC. (a) A licensee or registrant shall make or cause to be made, as appropriate, surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits for individual members of the public in sub. (1).

(b) A licensee or registrant shall show compliance with the annual dose limit in sub. (1) by either of the following means:

1. Demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed or registered operation does not exceed the annual dose limit.

2. Demonstrating both of the following:

a. The annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in Table II of Appendix E.

b. If an individual were continuously present in an unrestricted area, the dose from external sources would not exceed 0.02 mSv (2 mrem) in an hour and 0.5 mSv (50 mrem) in a year.

(c) Upon approval from the department, a licensee or registrant may adjust the effluent concentration values in Table II of Appendix E for members of the public to take into account the actual physical and chemical characteristics of the effluents, such as aerosol size distribution, solubility, density and chemical form.

HFS 157.24 Testing for leakage or contamination of sealed sources. (1) GENERAL REQUIREMENTS. A licensee or registrant in possession of any sealed source shall ensure that all of the following requirements are met:

(a) Each sealed source, other than hydrogen-3, with a half-life of 30 days or more and in any form other than gas or seeds of iridium-192 encased in nylon ribbon, shall be tested for leakage or contamination as follows:

1. Prior to initial use.

2. Unless otherwise authorized by the department, the NRC or another agreement state, at intervals not to exceed 6 months, except that each source designed to emit alpha particles shall be tested at intervals not to exceed 3 months.

3. At any time there is reason to suspect that a sealed source might have been damaged or might be leaking, it shall be tested for leakage before further use.

4. In the absence of a certificate from a transferor indicating that a test for leakage has been made within 6 months prior to the transfer, the sealed source may not be put into use until tested and the results received.

(b) Notwithstanding the provisions of par. (a), sources not in use and identified as being in storage shall meet all the following conditions:

1. Sources other than brachytherapy or teletherapy sources shall be tested for leakage at intervals not to exceed 5 years.

2. Sources shall be tested for leakage and test results received prior any use or transfer, unless a test for leakage has been made within 6 months prior to the date of use or transfer.

3. Sources in storage shall be inventoried at intervals not to exceed 6 months.

(c) Tests for leakage for all sealed sources, except brachytherapy sources manufactured to contain radium, shall be capable of detecting the presence of 185 Bq (0.005 uCi) of radioactive material on a test sample. Test samples shall be taken from the sealed source or

from the surfaces of the container in which the sealed source is stored or mounted on which one might expect contamination to accumulate. For a sealed source contained in a device, test samples shall be obtained when the source is in the "off" position.

(d) Tests for leakage for brachytherapy sources manufactured to contain radium shall be capable of detecting an absolute leakage rate of 37 Bq (0.001 uCi) of radon-222 in a 24 hour period when the collection efficiency for radon-222 and its progeny has been determined with respect to collection method, volume and time.

(e) Test samples shall be taken from the interior surfaces of the container in which sealed sources of radium are stored. The test shall be capable of detecting the presence of 185 Bq (0.005 uCi) of a radium daughter that has a half-life greater than 4 days.

(2) EXEMPTIONS. Notwithstanding the requirements in sub. (1), any sealed source is exempt from tests for leakage when the sealed source contains 3.7 MBq (100 uCi) or less of beta- or gamma-emitting material or 0.37 MBq (10 uCi) or less of alpha-emitting material.

(3) AUTHORIZATION TO CONDUCT TESTING. Tests for leakage or contamination from sealed sources shall be performed by persons specifically authorized by the department, an agreement state, a licensing state or the NRC to perform the services.

(4) RECORDS. Records of test results for sealed sources shall be made under s. HFS 157.31 (4).

(5) LEAKAGE CRITERIA. Any of the following shall be considered evidence that a sealed source is leaking:

(a) The presence of 185 Bq (0.005 µCi) or more of removable contamination on any test sample.

(b) Leakage of 37 Bq (0.001 µCi) of radon-222 per 24 hours for sources manufactured to contain radium.

(c) The presence of removable contamination resulting from the decay of 185 Bq (0.005 µCi) or more of radium.

(6) ACTION REQUIRED DUE TO A LEAKING SOURCE. A licensee or registrant shall immediately withdraw a leaking sealed source from use and shall take action to prevent the spread of contamination. The leaking sealed source shall be repaired or disposed of under the requirements of this chapter.

(7) REPORTS. Reports of test results for leaking or contaminated sealed sources shall be prepared under s. HFS 157.32 (7) and retained for 3 years after disposal or repair of the source.

HFS 157.25 Surveys and monitoring. (1) GENERAL REQUIREMENTS. (a) A licensee or registrant shall make or cause to be made all the following surveys:

1. Surveys necessary for the licensee or registrant to comply with this subchapter.

2. Surveys necessary and reasonable under the circumstances to evaluate any of the following:

- a. Radiation levels.
- b. Concentrations or quantities of radioactive material.
- c. The potential radiological hazards.

(b) A licensee or registrant shall ensure that instruments and equipment used for quantitative radiation measurements, including dose rate and effluent monitoring, are calibrated at intervals not to exceed 12 months for the radiation measured, except when a more frequent interval is specified elsewhere in this chapter or in a license condition.

(c) All personnel dosimeters, except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to any extremity, that require processing to determine the radiation dose and that are used by licensees and registrants to comply with s. HFS 157.22 (1), with other applicable provisions of this chapter or with conditions specified in a license or registration shall be processed and evaluated by a dosimetry processor that meets both of the following conditions:

1. Holds current personnel dosimetry accreditation from the national voluntary laboratory accreditation program of the national institute of standards and technology.

2. Is approved in this accreditation process for the type of radiation or radiations included in the national voluntary laboratory accreditation program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.

(2) CONDITIONS REQUIRING INDIVIDUAL MONITORING OF EXTERNAL AND INTERNAL OCCUPATIONAL DOSE. A licensee or registrant shall monitor exposures from sources of radiation at levels sufficient to demonstrate compliance with the occupational dose limits of this subchapter. Monitoring devices may be changed quarterly, provided the assignee has not exceeded 10 percent of the occupational limits in s. HFS 157.22 (1) (a). If the assignee exceeds 10 percent of the occupational limits, the monitoring device shall be changed monthly. As a minimum, a licensee or registrant shall do all the following:

(a) Monitor occupational exposure to radiation sources under their control and supply and require the use of individual monitoring devices by all of the following:

1. Adults likely to receive, in one year from sources external to the body, a dose in excess of 10 percent of the limits in s. HFS 157.22 (1) (a). Monitoring devices shall be individually assigned and not shared.

2. Minors who are at risk of receiving over 10 percent of the applicable limits in s. HFS 157.22 (7) (a).

3. A declared pregnant woman likely to receive, in one year from sources external to the body, a dose in excess of one mSv (0.1 rem).

4. An individual entering a high or very high radiation area.

5. An individual working within 6 feet of operating medical fluoroscopic equipment.

6. Individuals operating portable moisture or density measuring devices.

(b) Monitor, to determine compliance with s. HFS 157.22 (4), the occupational intake of radioactive material by and assess the committed effective dose equivalent to all of the following individuals:

1. Adults likely to receive, in one year, an intake in excess of 10 percent of the applicable ALI in Table I, Columns 1 and 2, of Appendix E.

2. Minors likely to receive, in one year, a committed effective dose equivalent in excess of 1.0 mSv (100 mrem).

3. Declared pregnant women likely to receive, during the entire pregnancy, a committed dose equivalent in excess of 1.0 mSv (100 mrem).

(3) LOCATION OF INDIVIDUAL MONITORING DEVICES. A licensee or registrant shall ensure that individuals who are required to monitor occupational doses under sub. (2) wear individual monitoring devices as follows:

(a) An individual monitoring device used for monitoring the dose to the whole body shall be worn at the unshielded location of the whole body likely to receive the highest exposure.

(b) If a protective apron is worn, the individual monitoring device shall be located at the neck, which is the collar. If a second monitoring device is used, for the same purpose, it shall be located under the protective apron at the waist. The estimated effective dose equivalent (H_E) when wearing 2 monitoring devices, one located outside and one under a protective apron, shall be calculated using the following formula: $H_E (\text{estimate}) = 1.5 H_W + 0.04 H_N$ where H_W = badge reading from the waist badge under the apron and H_N = badge reading from the neck badge worn outside the apron.

(c) An individual monitoring device used for monitoring the dose to an embryo or fetus of a declared pregnant woman, under s. HFS 157.22 (8) (a), shall be located at the waist under any protective apron being worn by the woman.

(d) An individual monitoring device used for monitoring the lens dose equivalent, to demonstrate compliance with s. HFS 157.22 (1) (a) 2. a., shall be located at the neck or collar, outside any protective apron being worn by the monitored individual or at an unshielded location closer to the eye.

(e) An individual monitoring device used for monitoring the dose to the extremities, to demonstrate compliance with s. HFS 157.22 (1) (a) 2. b., shall be worn on the extremity likely to receive the highest exposure. Each individual monitoring device shall be oriented to measure the highest dose to the extremity being monitored.

HFS 157.26 Control of exposure from external sources in restricted areas. (1)
CONTROL OF ACCESS TO HIGH RADIATION AREAS. (a) A licensee or registrant shall ensure that each entrance or access point to a high radiation area has one or more of the following features:

1. A control device that, upon entry into the area, causes the level of radiation to be reduced below that level at which an individual might receive a deep dose equivalent of one mSv (100 mrem) in one hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

2. A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the area are made aware of the entry.

3. Entryways that are locked, except during periods when access to the areas is required, with control over each individual entry.

(b) In place of the controls required under par. (a) for a high radiation area, a licensee or registrant may substitute continuous direct or electronic surveillance that is capable of preventing unauthorized entry.

(c) A licensee or registrant may apply to the department for approval of alternative methods for controlling access to high radiation areas.

(d) A licensee or registrant shall establish the controls required under par. (a) 1. and 3. in a way that does not prevent individuals from leaving a high radiation area.

(e) A licensee or registrant is not required to control each entrance or access point to a room or other area that is a high radiation area solely because of the presence of radioactive materials prepared for transport and packaged and labeled under the regulations of the U.S. department of transportation provided that all of the following conditions are met:

1. The packages do not remain in the area longer than 3 days.

2. The dose rate at one meter from the external surface of any package does not exceed 0.1 mSv (10 mrem) per hour.

(f) A licensee or registrant is not required to control entrance or access to rooms or other areas in hospitals solely because of the presence of patients containing radioactive material, provided there are personnel in attendance who are taking the necessary precautions to prevent the exposure of individuals to radiation or radioactive material in excess of the established limits in this subchapter and to operate within the ALARA provisions of the licensee's or registrant's radiation protection program.

(g) A registrant is not required to control entrance or access to rooms or other areas containing sources of radiation capable of producing a high radiation area if the registrant has met all the specific requirements for access and control specified in other applicable parts of this chapter, such as subch. IV for industrial radiography and subch. VIII for x-rays in the healing arts and accelerators.

(2) CONTROL OF ACCESS TO VERY HIGH RADIATION AREAS. (a) In addition to the requirements in sub. (1), a licensee or registrant shall institute measures to ensure that an individual is not able to gain unauthorized or inadvertent access to areas in which radiation levels could be encountered at 5 Gy (500 rad) or more in one hour at one meter from a source of radiation or any surface through which the radiation penetrates. This requirement does not

apply to rooms or areas in which diagnostic x-ray systems are the only source of radiation or to non-self-shielded irradiators.

(b) A licensee or registrant is not required to control entrance or access to rooms or other areas containing sources of radiation capable of producing a very high radiation area as described in par. (a) if the licensee or registrant has met all the specific requirements for access and control specified in other applicable parts of this chapter, such as subch. IV for industrial radiography and subch. VIII for x-rays in the healing arts and accelerators.

HFS 157.27 Respiratory protection and controls to restrict internal exposure in restricted areas. (1) **USE OF PROCESS OR OTHER ENGINEERING CONTROLS.** A licensee or registrant shall use, to the extent practical, process or other engineering controls, such as containment, decontamination or ventilation, to control the concentrations of radioactive material in air.

(2) **USE OF OTHER CONTROLS.** (a) When it is not practical to apply process or other engineering controls to control the concentrations of radioactive material in air to values below those that define an airborne radioactivity area, a licensee or registrant shall increase monitoring and limit intakes by one or more of the following means:

1. Control of access.
2. Limitation of exposure times.
3. Use of respiratory protection equipment.
4. Other controls.

(b) If a licensee or registrant performs an ALARA analysis to determine whether or not respirators should be used, a licensee or registrant may also consider the impact of respirator use on workers' industrial health and safety.

(3) **USE OF INDIVIDUAL RESPIRATORY PROTECTION EQUIPMENT.** (a) If a licensee or registrant uses respiratory protection equipment to limit intakes under sub. (2), all of the following criteria shall apply:

1. Except as provided in subd. 2., a licensee or registrant shall use only respiratory protection equipment that is tested and certified by the U.S. national institute for occupational safety and health.

2. A licensee or registrant may use equipment that has not been tested or certified by the U.S. national institute for occupational safety or for which there is no schedule for testing or certification, provided the licensee or registrant has submitted to the department and the department has approved a request for authorized use of that equipment. The request shall include documentation of a demonstration by testing, or a demonstration on the basis of test information, that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use.

3. A licensee or registrant shall implement and maintain a respiratory protection program that includes all of the following:

a. Air sampling sufficient to identify the potential hazard, permit proper equipment selection and estimate doses.

b. Surveys and bioassays, as necessary, to evaluate actual intakes.

c. Testing of respirators for operability immediately prior to each use.

4. A licensee or registrant shall have written procedures regarding all of the following:

a. Monitoring, including air sampling and bioassays.

b. Supervision and training of respirator users.

c. Fit testing.

d. Respirator selection.

e. Breathing air quality.

f. Inventory and control.

g. Storage, issuance, maintenance, repair, testing and quality assurance of respiratory protection equipment.

h. Record keeping of all items in this subd. par.

i. Limitations on periods of respirator use and relief from respirator use.

5. Prior to initial fitting of respirators, and at least every 12 months thereafter, a physician shall determine that the individual user is physically able to use the respiratory protection equipment.

6. Fit testing, with a fit factor ≥ 10 times the assigned protection factor for negative pressure devices, and a fit factor ≥ 500 for any positive pressure, continuous flow, and pressure-demand devices, before the first field use of tight fitting, face-sealing respirators and periodically thereafter at a frequency not to exceed one year. Fit testing shall be performed with the facepiece operating in the negative pressure mode.

(b) A licensee shall advise each respirator user that the user may leave the area at any time for relief from respirator use in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of operating conditions, or any other conditions that might require such relief.

(c) A licensee shall also consider limitations appropriate to the type and mode of use. When selecting respiratory devices the licensee shall provide for vision correction, adequate communication, low temperature work environments, and the concurrent use of other safety or radiological protection equipment. The licensee shall use equipment in such a way as not to interfere with the proper operation of the respirator.

(d) Standby rescue persons are required whenever one-piece atmosphere-supplying suits, or any combination of supplied air respiratory protection device and personnel protective

equipment are used from which an unaided individual would have difficulty extricating himself or herself. The standby persons shall be equipped with respiratory protection devices or other apparatus appropriate for the potential hazards. The standby rescue persons shall observe or otherwise maintain continuous communication with the workers via visual, voice, signal line, telephone, radio, or other suitable means, and be immediately available to assist them in case of a failure of the air supply or for any other reason that requires relief from distress. A sufficient number of standby rescue persons shall be immediately available to assist all users of this type of equipment and to provide effective emergency rescue if needed.

Note: Examples of means of continuous communication are visual, voice, signal line, telephone, radio or other suitable means.

(e) Atmosphere-supplying respirators shall be supplied with respirable air that meets the following requirements:

1. Oxygen content of 19.5-23.5 percent.
2. Condensed hydrocarbon content of 5 milligrams per cubic meter of air or less.
3. Carbon monoxide content of 10 ppm or less.
4. Carbon dioxide content of 1,000 ppm or less.
5. Lack of noticable odor.

(f) A licensee or registrant shall ensure that no objects, materials or substances, such as facial hair, or any conditions that interfere with the face to facepiece seal or valve function, and that are under the control of the respirator wearer, are present between the skin of the wearer's face and the sealing surface of a tight-fitting respirator facepiece.

(g) In estimating the dose to individuals from intake of airborne radioactive materials, the concentration of radioactive material in the air that is inhaled when respirators are worn is initially assumed to be the ambient concentration in air without respiratory protection, divided by the assigned protection factor. If the dose is later found to be greater than the estimated dose, the corrected value must be used. If the dose is later found to be less than the estimated dose, the corrected value may be used.

(4) APPLICATION FOR USE OF HIGHER ASSIGNED PROTECTION FACTORS. (a) A licensee or registrant shall obtain authorization from the department before using assigned protection factors in excess of those specified in Appendix D.

(b) The department may authorize a licensee or registrant to use higher assigned protection factors on receipt of an application that meets the following criteria:

1. Describes the situation for which a need exists for higher protection factors.
2. Demonstrates that the respiratory protection equipment provides these higher protection factors under the proposed conditions of use.

HFS 157.28 Storage and control of licensed or registered sources of radiation. (1)
SECURITY AND CONTROL OF LICENSED OR REGISTERED RADIOACTIVE MATERIALS.

(a) A licensee or registrant shall secure licensed or registered radioactive material in an unrestricted area from unauthorized removal or access.

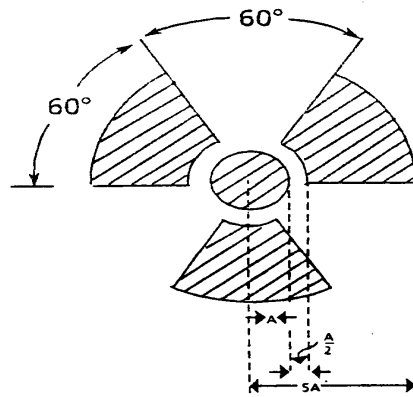
(b) A licensee or registrant shall maintain constant surveillance, or use devices or administrative procedures, to prevent unauthorized use of licensed or registered radioactive material that is in an unrestricted area and that is not in storage.

(2) SECURITY AND CONTROL OF REGISTERED RADIATION MACHINES. (a) A registrant shall secure registered radiation machines from unauthorized removal.

(b) A registrant shall use devices or administrative procedures to prevent unauthorized use of registered radiation machines.

HFS 157.29 Precautionary procedures. (1) CAUTION SIGNS. (a) *Standard radiation symbol.* Unless otherwise authorized by the department, the standard radiation symbol shall use the colors magenta, purple or black on a yellow background and shall be the 3-bladed design depicted in Figure HFS 157.29.

Figure HFS 157.29. Radiation Symbol



1. Cross-hatched area is to be magenta, purple or black.
2. The background is to be yellow.

(b) *Exception to color requirements for standard radiation symbol.* Notwithstanding the requirements of par. (a), a licensee or registrant is authorized to label sources, source holders or device components containing sources of radiation that are subjected to high temperatures with conspicuously etched or stamped radiation caution symbols and without a color requirement.

(c) *Additional information on signs and labels.* In addition to the contents of signs and labels prescribed in this section, a licensee or registrant may provide, on or near the required signs and labels, additional information, as appropriate, to make individuals aware of potential radiation exposures and to minimize the exposures.

(2) POSTING REQUIREMENTS. (a) *Posting of radiation areas.* A licensee or registrant shall post a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA" in each radiation area.

(b) *Posting of high radiation areas.* A licensee or registrant shall post a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, HIGH RADIATION AREA" or "DANGER, HIGH RADIATION AREA" in each high radiation area.

(c) *Posting of very high radiation areas.* A licensee or registrant shall post a conspicuous sign or signs bearing the radiation symbol and the words "EXTREME DANGER, VERY HIGH RADIATION AREA" or "GRAVE DANGER, VERY HIGH RADIATION AREA" in each very high radiation area.

(d) *Posting of airborne radioactivity areas.* A licensee or registrant shall post a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, AIRBORNE RADIOACTIVITY AREA" or "DANGER, AIRBORNE RADIOACTIVITY AREA" in each airborne radioactivity area.

(e) *Posting of areas or rooms in which licensed or registered material is used or stored.* A licensee or registrant shall post a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)" in each area or room in which there is used or stored an amount of licensed or registered material exceeding 10 times the quantity of the material specified in Appendix F.

(3) EXCEPTIONS TO POSTING REQUIREMENTS. (a) A licensee or registrant is not required to post caution signs in areas or rooms containing sources of radiation for periods of less than 8 hours if all of the following conditions are met:

1. The sources of radiation are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to sources of radiation in excess of the limits established in this subchapter.

2. The area or room is subject to the licensee's or registrant's control.

(b) Rooms or other areas in hospitals that are occupied by patients are not required to be posted with caution signs under sub. (2) provided that the requirements of s. HFS 157.64 (2) (a) or 157.65 (4) (a) are met.

(c) Rooms or other areas in hospitals that are occupied by patients are not required to be posted with caution signs, provided that no member of the public could receive a deep dose equivalent in excess of 5 mSv (500 mrem) from entering the room during the patient's stay.

(d) A room or area is not required to be posted with a caution sign because of the presence of a sealed source provided the radiation level at 30 centimeters from the surface of the sealed source container or housing does not exceed 0.05 mSv (5 mrem) per hour.

(e) A room or area is not required to be posted with a caution sign because of the presence of radiation machines used solely for diagnosis in the healing arts.

(4) LABELING CONTAINERS AND RADIATION MACHINES. (a) A licensee or registrant shall ensure that each container of licensed or registered material bears a durable, clearly visible label bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL." The label shall also provide information, such as the radionuclides present, an estimate of the quantity of radioactivity, the

date for which the activity is estimated, radiation levels, kinds of materials and mass enrichment, to permit individuals handling or using the containers or working in the vicinity of the containers to take precautions to avoid or minimize exposures.

Note: Mass enrichment is a process used to increase the percentage of the isotope U-235 present in refined uranium. The amount of U-235 present is expressed in percent enrichment on the label.

(b) A licensee or registrant shall, prior to removal or disposal of empty uncontaminated containers to unrestricted areas, remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials.

(c) A registrant shall ensure that each radiation machine is conspicuously labeled cautioning individuals that radiation is produced when it is energized.

(5) EXEMPTIONS TO LABELING REQUIREMENTS. A licensee or registrant is not required to label any of the following:

(a) Containers holding licensed or registered material in quantities less than the quantities listed in Appendix F.

(b) Containers holding licensed or registered material in concentrations less than those specified in Table III of Appendix E.

(c) Containers attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the limits established by this subchapter.

(d) Containers in transport and packaged and labeled under the regulations of the U.S. department of transportation.

Note: Labeling of packages containing radioactive materials is required by the U.S. Department of Transportation if the amount and type of radioactive materials exceeds the limits for an excepted quantity or article as defined and limited by U.S. Department of Transportation regulations 49 CFR 173.403 (m) and (w) and 173.421 to 173.424.

(e) Containers that are accessible only to individuals authorized to handle or use them, or to work in the vicinity of the containers, if the contents are identified to these individuals by a readily available written record. The record shall be retained as long as the containers are in use for the purpose indicated on the record.

Note: Examples of the type of containers in par. (e) are containers in locations such as water-filled canals or storage vaults.

(f) Installed manufacturing or process equipment, such as piping and tanks.

(6) PROCEDURES FOR RECEIVING AND OPENING PACKAGES. (a) A licensee or registrant who expects to receive a package containing quantities of radioactive material in excess of a type A quantity shall make arrangements to receive the package under either of the following conditions:

1. When the carrier offers it for delivery.

2. Upon notification of the arrival of the package at the carrier's terminal and possession of the package is taken expeditiously.

(b) A licensee or registrant shall do all the following:

1. Monitor the external surfaces of a labeled package for radioactive contamination unless the package contains only radioactive material in the form of gas or in special form as defined in subch. I.

2. Monitor the external surfaces of a labeled package for radiation levels unless the package contains quantities of radioactive material that are less than or equal to the type A quantity.

3. Monitor all packages known to contain radioactive material for radioactive contamination and radiation levels if there is evidence of degradation of package integrity, such as packages that are crushed, wet or damaged.

(c) In par. (b), "labeled" means displaying a Radioactive White I, Yellow II, or Yellow III label as specified in U.S. department of transportation regulations 49 CFR 172.403 and 172.436 to 172.440.

(d) A licensee or registrant shall perform the monitoring required by par. (b) as soon as practicable after receipt of the package, but not later than 3 hours after the package is received at the licensee's or registrant's facility if it is received during the licensee's or registrant's normal working hours or if there is evidence of degradation of package integrity, such as a package that is crushed, wet or damaged. If a package is received after working hours and has no evidence of degradation of package integrity, the package shall be monitored no later than 3 hours from the beginning of the next working day.

(e) A licensee or registrant shall immediately notify the final delivery carrier and, by telephone and either telegram or facsimile, the department under either of the following conditions:

1. Removable radioactive surface contamination exceeds the limits of s. HFS 157.94 (1) (h).

2. External radiation levels exceed the limits of s. HFS 157.94 (1) (i).

Note: The department may be reached during normal business hours of 7:45 am to 4:30 pm, Monday through Friday, except state holidays, at 608-276-4797. The facsimile transmission number is 608-267-2744.

(f) A licensee or registrant shall do all the following:

1. Establish, maintain and retain written procedures for safely opening packages in which radioactive material is received.

2. Ensure that the procedures are followed and that due consideration is given to special instructions for the type of package being opened.

(g) A licensee or registrant transferring special form sources in vehicles owned or operated by the licensee or registrant to and from a work site is exempt from the contamination monitoring requirements of par. (b), but is not exempt from the monitoring requirement in par. (b) for measuring radiation levels that ensures that the source is still properly lodged in its shield.

HFS 157.30 Waste management. (1) GENERAL REQUIREMENTS. (a) A licensee or registrant disposing of licensed or registered material may use any of the following methods:

1. Transfer to an authorized recipient as provided in sub.(6) or in subch. II, or to the U.S. department of energy.

2. Decay while in storage.

3. Release in effluents within the limits in s. HFS 157.23 (1).

4. Dispose of as authorized under sub. (2), (3), (4) or (5).

(b) A person shall be specifically licensed or registered to receive waste containing licensed or registered material from other persons for any of the following:

1. Treatment prior to disposal.

2. Treatment or disposal by incineration.

3. Decay while in storage.

4. Disposal at a land disposal facility authorized to receive radioactive waste.

5. Storage until transferred to a storage or disposal facility authorized to receive the waste.

(2) METHOD FOR OBTAINING APPROVAL OF PROPOSED DISPOSAL PROCEDURES. A licensee or registrant or applicant for a license or registration may apply to the department for approval of proposed procedures, not otherwise authorized in this chapter, to dispose of licensed or registered material generated in the licensee's or registrant's operations. Each application shall be in writing and shall include all of the following:

(a) A description of the waste containing licensed or registered material to be disposed of, including the physical and chemical properties that have an effect on risk evaluation and the proposed manner and conditions of waste disposal.

(b) An analysis and evaluation of information on the nature of the environment.

(c) The nature and location of other potentially affected facilities.

(d) Analyses and procedures to ensure that doses are maintained ALARA and within the dose limits in this chapter.

(3) DISPOSAL BY RELEASE INTO SANITARY SEWERAGE. (a) A licensee or registrant may discharge licensed or registered material into sanitary sewerage if each of the following conditions is satisfied:

1. The material is readily soluble, or is readily dispersible biological material, in water.

2. The quantity of licensed or registered radioactive material that the licensee or registrant releases into the sewer in one month divided by the average monthly volume of water released into the sewer by the licensee or registrant does not exceed the concentration listed in Table III of Appendix E.

3. If more than one radionuclide is released, all the following conditions shall also be satisfied:

a. A licensee or registrant shall determine the fraction of the limit in Table III of Appendix E represented by discharges into sanitary sewerage by dividing the actual monthly average concentration of each radionuclide released by the licensee or registrant into the sewer by the concentration of that radionuclide listed in Table III of Appendix E.

b. The sum of the fractions for each radionuclide required by subd. par. a. does not exceed unity.

c. The total quantity of licensed or registered radioactive material that the licensee or registrant releases into the sanitary sewerage in a year does not exceed 185 GBq (5 Ci) of hydrogen-3, 37 GBq (1 Ci) of carbon-14 and 37 GBq (1 Ci) of all other radioactive materials combined.

(b) Excreta from individuals undergoing medical diagnosis or therapy with radioactive material are not subject to the limitations contained in par. (a).

(4) TREATMENT OR DISPOSAL BY INCINERATION. A licensee or registrant may treat or dispose of licensed or registered material by incineration only in the form and concentration specified in sub. (5) or as specifically approved by the department under sub. (2).

(5) DISPOSAL OF SPECIFIC WASTES. (a) A licensee or registrant may dispose of all of the following licensed or registered material as if the material were not radioactive:

1. 1.85 kBq (0.05 uCi) or less of hydrogen-3, iodine-125 or carbon-14 per gram of medium used for liquid scintillation counting.

2. 1.85 kBq (0.05 uCi) or less of hydrogen-3, iodine-125 or carbon-14 per gram of animal tissue, averaged over the weight of the entire animal.

(b) A licensee or registrant may not dispose of tissue under par. (a) 2. in a manner that would permit its use either as food for humans or as animal feed.

(c) A licensee or registrant shall maintain records under s. HFS 157.31 (9).

(6) TRANSFER FOR DISPOSAL AND MANIFESTS. (a) The requirements of this subsection and Appendix G are designed to control transfers of low-level radioactive waste by any waste generator, waste collector or waste processor licensee who ships low level waste

either directly, or indirectly through a waste collector or waste processor, to a licensed low level waste land disposal facility; establish a shipping manifest tracking system and supplement existing requirements concerning transfers and record keeping for those wastes.

(b) Any licensee shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility shall document the information required in Appendix G, Section I and transfer this recorded information to the intended consignee in accordance with the requirements of Appendix G.

(c) Each shipment manifest shall include a certification by the waste generator as specified in Appendix G, Section II.

(d) Each person involved in the transfer of waste for disposal or in the disposal of waste, including the waste generator, waste collector, waste processor and disposal facility operator, shall comply with the requirements specified in Appendix G, Section III.

(7) COMPLIANCE WITH ENVIRONMENTAL AND HEALTH PROTECTION REGULATIONS. Nothing in subs. (1) to (6) relieves a licensee or registrant from complying with other applicable federal, state and local regulations governing any other toxic or hazardous properties of materials that may be disposed of according to subs. (1) to (6).

HFS 157.31 Records. (1) GENERAL PROVISIONS. (a) A licensee or registrant shall use the SI units becquerel, gray, sievert and coulomb per kilogram, or the SI units and the special units curie, rad, rem and roentgen, including multiples and subdivisions, and shall clearly indicate the units of all quantities on records required by this subchapter.

(b) A licensee or registrant shall make a clear distinction among the quantities entered on the records required by this subchapter, such as total effective dose equivalent, shallow dose equivalent, lens dose equivalent, deep dose equivalent or committed effective dose equivalent.

(2) RECORDS OF RADIATION PROTECTION PROGRAMS. (a) A licensee or registrant shall maintain records of the radiation protection program, including all of the following:

1. The provisions of the program.
2. Audits and other reviews of program content and implementation.

(b) A licensee or registrant shall retain the records required by par. (a) 1. until the department terminates each pertinent license or registration requiring the record. A licensee or registrant shall retain the records required by par. (a) 2. for 3 years after the record is made.

(3) RECORDS OF SURVEYS. (a) A licensee or registrant shall maintain records showing the results of surveys and calibrations required by ss. HFS 157.25 (1) and 157.29 (6). A licensee or registrant shall retain these records for 3 years after the record is made.

(b) A licensee or registrant shall retain each of the following records until the department terminates each pertinent license or registration requiring the record:

1. Records of the results of surveys to determine the dose from external sources of radiation used, in the absence of or in combination with individual monitoring data, in the assessment of individual dose equivalents.

2. Records of the results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose.

3. Records showing the results of air sampling, surveys and bioassays required under s. HFS 157.27 (3) 3. a. and b.

4. Records of the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment.

(4) RECORDS OF TESTS FOR LEAKAGE OR CONTAMINATION OF SEALED SOURCES. Records of tests for leakage or contamination of sealed sources required by s. HFS 157.24 shall be kept in units of becquerel or microcurie and maintained for inspection by the department for 5 years after the records are created.

(5) RECORDS OF PRIOR OCCUPATIONAL DOSE. A licensee or registrant shall retain the records of prior occupational dose and exposure history as specified in s. HFS 157.22 (5) on the department's occupational radiation exposure form or equivalent until the department terminates each pertinent license or registration requiring this record. A licensee or registrant shall retain records used in preparing the occupational radiation exposure form or equivalent for 3 years after the record is created.

(6) RECORDS OF PLANNED SPECIAL EXPOSURES. (a) For each use of the provisions of s. HFS 157.22 (6) for planned special exposures, a licensee or registrant shall maintain records that describe all of the following:

1. The exceptional circumstances requiring the use of a planned special exposure.
2. The name of the management official who authorized the planned special exposure and a copy of the signed authorization.
3. What actions were necessary.
4. Why the actions were necessary.
5. What precautions were taken to assure that doses were maintained ALARA.
6. What individual and collective doses were expected to result.
7. The doses actually received in the planned special exposure.

(b) A licensee or registrant shall retain the records until the department terminates each pertinent license or registration requiring these records.

(7) RECORDS OF INDIVIDUAL MONITORING RESULTS. (a) A licensee or registrant shall maintain records of doses received by all individuals for whom monitoring is required under s. HFS 157.25 (2) and records of doses received during planned special exposures, accidents and emergency conditions. Assessments of dose equivalent and records made using units in effect before August 1, 2002 need not be changed. These records shall include all of the following, when applicable:

1. The deep dose equivalent to the whole body, lens dose equivalent, shallow dose equivalent to the skin and shallow dose equivalent to the extremities.

2. The estimated intake of radionuclides.

Note: See HFS 157.22 (2) for occupational exposure limits.

3. The committed effective dose equivalent assigned to the intake of radionuclides.

4. The specific information used to calculate the committed effective dose equivalent under s. HFS 157.22 (4) (c).

5. The total effective dose equivalent when required by s. HFS 157.22 (2).

6. The total of the deep dose equivalent and the committed dose to the organ receiving the highest total dose.

(b) A licensee or registrant shall make entries of the records specified in par. (a) at intervals not to exceed one year.

(c) A licensee or registrant shall maintain the records specified in par. (a) on the department's record of individual monitoring results form, under the instructions for the form, or in clear and legible records containing all the information required by the department's record of individual monitoring results form.

Note: The form may be obtained by writing the Department at: Department of Health and Family Services, Radiation Protection Section, P.O. Box 2659, Madison WI 53701-2659; or by downloading from the Department website at: www.dhfs.state.wi.us/licensing/.

(d) A licensee or registrant shall maintain the records of dose to an embryo or fetus with the records of dose to the declared pregnant woman. The declaration of pregnancy, including the estimated date of conception, shall also be kept on file, but may be maintained separately from the dose records.

(e) A licensee or registrant shall retain each required form or record under this subsection until the department terminates the pertinent license or registration requiring the record.

(f) Upon termination of the license or registration, a licensee or registrant shall permanently store individual monitoring records on the department's occupational radiation exposure form or equivalent.

(g) Individual exposure records required under this subsection shall be protected from public disclosure subject to the requirements of s. 153.50, Stats.

(8) RECORDS OF DOSE RECEIVED BY INDIVIDUAL MEMBERS OF THE PUBLIC. (a) A licensee or registrant shall maintain records sufficient to demonstrate compliance with the dose limit under s. HFS 157.23 (1) for individual members of the public.

(b) A licensee or registrant shall retain the records required by par. (a) until the department terminates each pertinent license or registration requiring the record.

(9) RECORDS OF WASTE DISPOSAL. (a) A licensee or registrant shall maintain records of the disposal of licensed or registered materials, including disposal authorized before August 1, 2002.

(b) A licensee or registrant shall retain the records required by par.(a) until the department terminates the pertinent license or registration requiring the record.

(10) RECORDS OF TESTING ENTRY CONTROL DEVICES FOR VERY HIGH RADIATION AREAS. (a) A licensee or registrant shall maintain records of tests on entry control devices for very high radiation areas. These records shall include the date, time and results of each test of function.

(b) A licensee or registrant shall retain the records required by par. (a) for 3 years after the record is made.

(11) FORM OF RECORDS. (a) Each record required by this section shall be legible throughout the specified retention period. Records, such as letters, drawings and specifications, shall include all pertinent information, such as stamps, initials and signatures. A licensee shall maintain adequate safeguards against tampering with and loss of records.

(b) Except as provided in par, (c), the record shall be the original or a reproduced copy or a microform, provided the copy or microform is authenticated by authorized personnel and the microform is capable of producing a clear copy throughout the required retention period.

(c) The record may be stored in electronic media with the capability for producing legible, accurate and complete records during the required retention period.

HFS 157.32 Reports. (1) REPORTS OF STOLEN, LOST OR MISSING LICENSED OR REGISTERED SOURCES OF RADIATION. (a) A licensee or registrant shall report to the department by telephone any of the following:

1. Immediately after its occurrence becomes known to a licensee or registrant, stolen, lost or missing licensed or registered radioactive material in an aggregate quantity equal to or greater than 1,000 times the quantity specified in Appendix F under circumstances that make it appear to the licensee or registrant that an exposure could result to individuals in unrestricted areas.

2. Within 30 days after its occurrence becomes known to a licensee or registrant, lost, stolen or missing licensed or registered radioactive material in an aggregate quantity greater than 10 times the quantity specified in Appendix F that is still missing.

3. Immediately after its occurrence becomes known to the registrant, a stolen, lost or missing radiation machine.

Note: The Department may be reached during normal business hours of 7:45 am to 4:30 pm, Monday through Friday, except state holidays, at 608-276-4797 or other times at 608-258-0099.

(b) A licensee or registrant required to make a report under par. (a) shall, within 30 days after making a telephone report, make a written report to the department setting forth all the following information:

1. A description of the licensed or registered source of radiation involved, including, for radioactive material, the kind, quantity and chemical and physical form; and, for radiation machines, the manufacturer, model and serial number, type and maximum energy of radiation emitted.

2. A description of the circumstances under which the loss or theft occurred.

3. A statement of the disposition or probable disposition of the licensed or registered source of radiation involved.

4. Exposures of individuals to radiation, circumstances under which the exposures occurred and the possible total effective dose equivalent to persons in unrestricted areas.

5. Actions that have been taken or will be taken to recover the source of radiation.

6. Procedures or measures that have been or will be adopted to ensure against a recurrence of the loss or theft of licensed or registered sources of radiation.

(c) Subsequent to filing the written report, the licensee or registrant shall report any additional substantive information on the loss or theft within 30 days after the licensee or registrant learns of the information.

(d) On any report filed with the department under this subsection, a licensee or registrant shall record the names of individuals who may have received exposure to radiation in a separate and detachable portion of the report.

Note: Reports should be sent to the Department at the following address: Department of Health and Family Services, Radiation Protection Section, PO Box 2659, Madison WI 53701-2659.

(2) NOTIFICATION OF RADIATION INCIDENTS. (a) Notwithstanding other requirements for notification, a licensee or registrant shall immediately report to the department each event involving a source of radiation possessed by the licensee or registrant that may have caused or threatens to cause any of the following conditions:

1. An individual to receive any of the following:

- a. A total effective dose equivalent of 0.25 Sv (25 rem) or more.

- b. An eye dose equivalent of 0.75 Sv (75 rem) or more.

- c. A shallow dose equivalent to the skin or extremities or a total organ dose equivalent of 2.5 Gy (250 rad) or more.

2. The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake 5 times the

occupational ALI. This subdivision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

(b) A licensee or registrant shall, within 24 hours of discovery of the event, report to the department each event involving loss of control of a licensed or registered source of radiation possessed by the licensee or registrant that may have caused, or threatens to cause, any of the following conditions:

1. An individual to receive, in a period of 24 hours, any of the following:

- a. A total effective dose equivalent exceeding 0.05 Sv (5 rem).

- b. An eye dose equivalent exceeding 0.15 Sv (15 rem).

- c. A shallow dose equivalent to the skin or extremities or a total organ dose equivalent exceeding 0.5 Sv (50 rem).

2. The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake in excess of one occupational ALI. This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

(c) A licensee or registrant shall make the reports to the department required by pars. (a) and (b) initially by telephone and shall confirm the initial contact by facsimile to the department. Reports shall contain all of the following information:

1. Caller's name and a telephone number through which the department may reach the caller.

2. Description of the event, including date and time.

3. Exact location of the event.

4. Isotopes, quantities, chemical and physical form of the radioactive material involved, if applicable.

5. Any available personnel radiation exposure data.

(d) A licensee or registrant shall record the names of individuals who have received exposure to sources of radiation in a separate and detachable portion of each report filed with the department under this subsection.

(e) This subsection does not apply to doses that result from planned special exposures, provided those doses are within the limits for planned special exposures and are reported under sub. (4).

Note: The Department may be contacted during normal work hours of 7:45 am to 4:30 pm, Monday through Friday, except state holidays, at 608-267-4797; or other times at 608-258-0099 and facsimile 608-267-3695.

(3) REPORTS OF EXPOSURES, RADIATION LEVELS AND CONCENTRATIONS OF RADIOACTIVE MATERIAL EXCEEDING THE LIMITS. (a) In addition to the notification required by sub. (2), a licensee or registrant shall submit a written report to the department within 30 days after learning of any of the following occurrences:

1. Radiation incidents for which notification is required by sub. (2).
2. Doses in excess of any of the following:
 - a. The occupational dose limits for adults in s. HFS 157.22 (1).
 - b. The occupational dose limits for a minor in s. HFS 157.22 (7).
 - c. The limits for an embryo or fetus of a declared pregnant woman in s. HFS 157.22 (8).
 - d. The limits for a member of the public in s. HFS 157.23 (1).
 - e. Any applicable limit in the license or registration.
 - f. The ALARA constraints for air emissions established under s. HFS 157.21 (4).
3. Levels of radiation or concentrations of radioactive material in any of the following:
 - a. A restricted area in excess of applicable limits in the license or registration.
 - b. An unrestricted area in excess of 10 times the applicable limit set forth in this subchapter or in the license or registration, whether or not involving exposure of any individual in excess of the limits specified in s. HFS 157.23 (1).
4. For a licensee subject to the provisions of the U.S. environmental protection agency's generally applicable environmental radiation standards in 40 CFR 190, levels of radiation or releases of radioactive material in excess of those standards or of license conditions related to those standards.
 - (b) Each report required by par. (a) shall describe the extent of exposure of individuals to radiation and radioactive material, including all the following, as appropriate:
 1. Description of the event, including the probable cause of the elevated exposures, dose rates or concentrations and the manufacturer and model number of any equipment that failed or malfunctioned.
 2. Date, time and exact location of the event.
 3. The levels of radiation and concentrations of radioactive material involved.
 4. Estimates of each individual's dose.
 5. Corrective steps taken or planned to ensure against a recurrence, including the schedule for achieving conformance with applicable limits, generally applicable environmental standards and associated license or registration conditions.

6. For each individual exposed: the name, unique identification number and date of birth. With respect to the limit for the embryo or fetus in s. HFS 157.22 (8), the identifiers should be those of the declared pregnant woman. The report shall be prepared so that this information is stated in a separate and detachable portion of the report.

(4) REPORTS OF PLANNED SPECIAL EXPOSURES. A licensee or registrant shall submit a written report to the department within 30 days following any planned special exposure conducted under s. HFS 157.22 (6), informing the department that a planned special exposure was conducted and indicating the date the planned special exposure occurred and the information required by s. HFS 157.31 (6).

(5) REPORTS OF INDIVIDUAL MONITORING. (a) This subsection applies to any person licensed or registered by the department to do any of the following:

1. Possess or use sources of radiation for purposes of industrial radiography under subchs. II and IV of this chapter.

2. Receive radioactive waste from other persons for disposal.

3. Possess or use at any time, for processing or manufacturing for distribution under subchs. II or VI of this chapter, radioactive material in quantities exceeding any one of the following:

Radionuclide	Activity	
	Ci	GBq
Cesium-137	1	37
Cobalt-60	1	37
Gold-198	100	3,700
Iodine-131	1	37
Iridium-192	10	370
Krypton-85	1,000	37,000
Promethium-147	10	370
Technetium-99m	1,000	37,000

Note: The Department may require as a license condition, or by rule or order, reports from licensees or registrants who are licensed or registered to use radionuclides not on this list in quantities sufficient to cause comparable radiation levels.

(b) A licensee or registrant in a category listed in par. (a) shall submit an annual report of the results of individual monitoring carried out by the licensee or registrant for each individual for whom monitoring was required by s. HFS 157.25 (2) during that year. A licensee or registrant may include additional data for individuals for whom monitoring was provided but not required. A licensee or registrant shall use the department's record of individual monitoring results form or equivalent or electronic media containing all the information required by the department's record of individual monitoring results form.

Note: The form may be obtained by writing the Department at: Department of Health and Family Services, Radiation Protection Section, P.O. Box 2659, Madison WI 53701-2659; or by downloading from the Department website at: www.dhfs.state.wi.us/licensing/.

(c) A licensee or registrant shall file the report required by par. (b), covering the preceding year, on or before April 30 of each year. A licensee or registrant shall submit the report to the department.

Note: The report may be mailed to the department at: Department of Health and Family Services, Radiation Protection Section, PO Box 2659, Madison WI 53701-2659.

(6) NOTIFICATIONS AND REPORTS TO INDIVIDUALS. When a licensee or registrant is required under sub. (3), (4) or (5) to report to the department any exposure of an occupationally exposed individual or member of the public to radiation or radioactive material, a licensee or registrant shall also notify the individual who was exposed. The licensee or registrant shall transmit the notice to the individual no later than the transmittal to the department and the licensee or registrant shall comply with the provisions of s. HFS 157.88 (3) (a).

Note: Requirements for notification and reports to individuals of exposure to radiation or radioactive material are specified in s. HFS 157.88 (3).

(7) REPORTS OF LEAKING OR CONTAMINATED SEALED SOURCES. A licensee or registrant shall file a written report within 5 working days with the department if the test for leakage or contamination required under s. HFS 157.24 indicates a sealed source is leaking or contaminated. The report shall describe the equipment involved, the test results and the corrective action taken.

(8) VACATING PREMISES. A specific licensee or registrant shall, at least 30 days before vacating or relinquishing possession or control of premises which may have been contaminated with radioactive material as a result of the licensee's or registrant's activities, notify the department in writing of the licensee's or registrant's intent to vacate. When deemed necessary by the department, the licensee or registrant shall decontaminate the premises in such a manner as the department may specify.

HFS 157.33 Radiological criteria for license termination. (1) GENERAL. (a) The criteria in this section apply to the decommissioning of facilities licensed under this chapter, as well as other facilities under the department's jurisdiction.

(b) The criteria in this section do not apply to sites that meet any of the following criteria:

1. Have been decommissioned prior to August 1, 2002.
2. Have previously submitted and received NRC approval on a license termination plan or decommissioning plan.

(c) After a site has been decommissioned and the license terminated in accordance with the criteria in this section, the department shall require additional cleanup only if, based on new

information, the department determines that the criteria of this section were not met and residual radioactivity remaining at the site could result in a threat to public health and safety.

(d) When calculating TEDE to the average member of the critical group, the licensee shall determine the peak annual TEDE dose expected within the first 1000 years after decommissioning.

(2) RADIOLOGICAL CRITERIA FOR UNRESTRICTED USE. A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 0.25 mSv (25 mrem) per year, including exposure from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable. Determination of the levels that are ALARA shall consider any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.

(3) ALTERNATE CRITERIA FOR LICENSE TERMINATION. (a) The department may terminate a license using alternate criteria greater than the dose criterion in sub. (2) if the licensee does all of the following:

1. Provides assurance that public health and safety would continue to be protected, and that it is unlikely that the dose from all man-made sources combined, other than medical, would be more than the one mSv/y (100 mrem/y) limit specified under s. HFS 157.23 (1), by submitting an analysis of possible sources of exposure.

2. Reduces doses to ALARA levels, taking into consideration any detriments such as traffic accidents expected to potentially result from decontamination and waste disposal.

3. Has submitted a decommissioning plan to the department indicating the licensee's intent to decommission in accordance with provisions of this chapter, and specifying that the licensee proposes to decommission by use of alternate criteria. The licensee shall document in the decommissioning plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and addressed, as appropriate, following analysis of that advice. In seeking such advice, the licensee shall provide for all the following:

- a. Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning.

- b. An opportunity for a comprehensive, collective discussion on the issues by the participants.

- c. A publicly available summary of the results of all discussions held under subd. par. b., including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues.

(b) The department may approve the use of alternate criteria to terminate a license after the department considers any comments provided by the environmental protection agency and any public comments submitted under par. (a).

(4) PUBLIC NOTIFICATION AND PUBLIC PARTICIPATION. (a) Upon the receipt of a decommissioning plan from the licensee, or a proposal by the licensee for release of a site under sub. (3) or whenever the department deems such notice to be in the public interest, the department shall do all the following:

1. Notify and solicit comments from all the following:

a. Local and state governments in the vicinity of the site and any Indian nation or other indigenous people that have treaty or statutory rights that could be affected by the decommissioning.

b. The US environmental protection agency and the Wisconsin department of natural resources for cases where the licensee proposes to release a site under sub. (3).

2. Publish a notice in the Wisconsin Administrative Register and in a forum, such as local newspapers, that is readily accessible to individuals in the vicinity of the site, and solicit comments from affected parties.